

NCEI WATER LEVEL REPORT – Tsunami

UPDATE

August 11, 2020

Services

Rapid Response to March 25, 2020, M7.5 Severo-Kurilsk Event

After the March 25, 2020, magnitude 7.5 earthquake off the coast of Severo-Kurilsk, Kuril Islands, small tsunami-like sea level variations were observed at U.S. tide gauge stations. The phenomenon was extensively discussed on the Tsunami Bulletin Board, hosted by the Intergovernmental Oceanographic Commission of the United Nations Education, Scientific and Cultural Organization (IOC-UNESCO) and the National Oceanic and Atmospheric Administration (NOAA). The National Centers for Environmental Information and Cooperative Institute for Research in Environmental Sciences (NCEI/CIRES) Water Level Team provided analysis of the data and determined that a very small tsunami wave traveled across the Pacific Ocean and triggered small seiches in several ports and bays. The observed seiches were so small that without preliminary information about the March 25 event they would have been considered as a part of the background noise in water level observations. Figure 1 shows the tsunami and background signals at Sand Island, Midway Islands (NOS ID 1619910), after removing the tide.

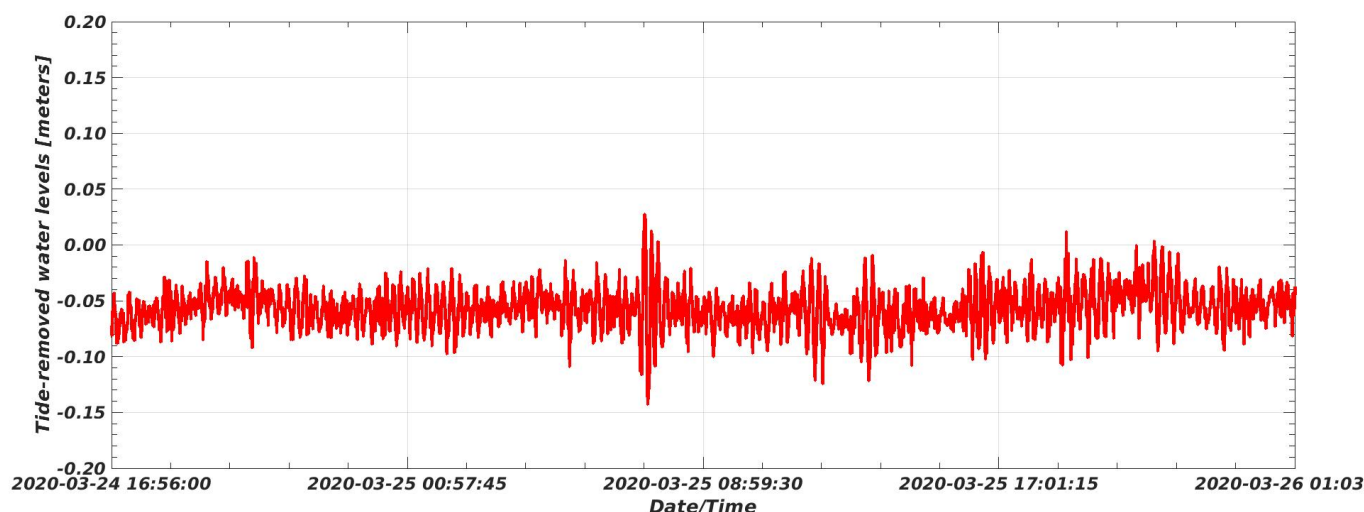
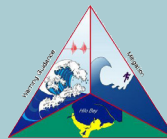


Figure 1: Water levels at Sand Island, Midway Islands (NOS ID 1619910), with tide removed, before and after the arrival of a small tsunami.

**Aaron Sweeney (Technical Lead), George Mungov (Research Lead),
and Lindsey Wright (Marigram Specialist)**

Cooperative Institute for Research in Environmental Sciences (CIRES)
University of Colorado, Boulder
and National Centers for Environmental Information (NCEI) Boulder, CO
Contact: haz.info@noaa.gov



Supporting Operational Needs of NOS/CO-OPS and NWS/NTWC

The National Ocean Service's Center for Operational Oceanographic Products and Services (NOS/CO-OPS) has begun incorporating information obtained from NCEI on the status of the National Weather Service's National Tsunami Warning Center (NWS/NTWC) water level stations to its daily [Continuous Operational Real-Time Monitoring System \(CORMS\)](#) Morning Report. As NCEI ingests water level data from NTWC, [our monitoring site](#) has become the go-to for daily information on NTWC's station status. NCEI is attributed as the source of this information within the "Tsunami Reports" section of the CORMS Morning Report. The CORMS Morning Report is used by CO-OPS to respond to user queries about the status of stations and helps identify gaps in real-time data coverage.

Products

Maps of Marigrams

Until recently, we did not have latitudes and longitudes assigned to most of [NCEI's collection of scanned images of paper tide gauge records \(marigrams\)](#). We endeavored to fill this void and have provided a map of the marigram stations below (Figure 2). There are about 400 stations represented. The collection includes marigrams covering tsunami events that occurred between 1854 and 1981. Figure 3 shows the number of marigrams at each location as a scaled circle (larger circles have more marigrams), with a legend. The top ten stations, in terms of number of marigrams, include 1330 (38%) marigrams, with the 11th category of "Other" covering the rest: 2216 (62%) marigrams. Table 1 below shows the number of marigrams per station.

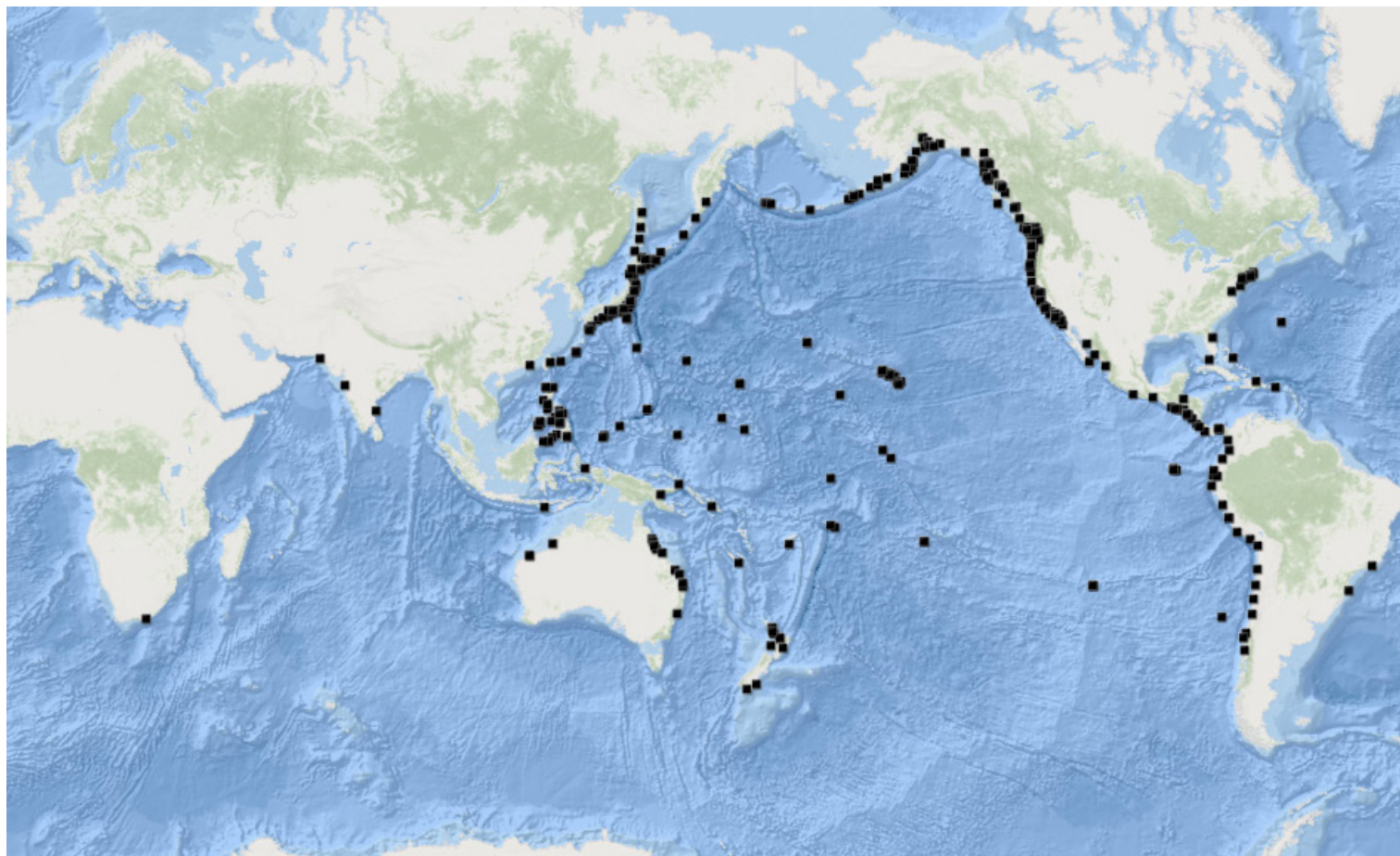


Figure 2: Map of marigram locations. NCEI's collection includes marigrams gathered between 1854 and 1981 at about 400 different locations.

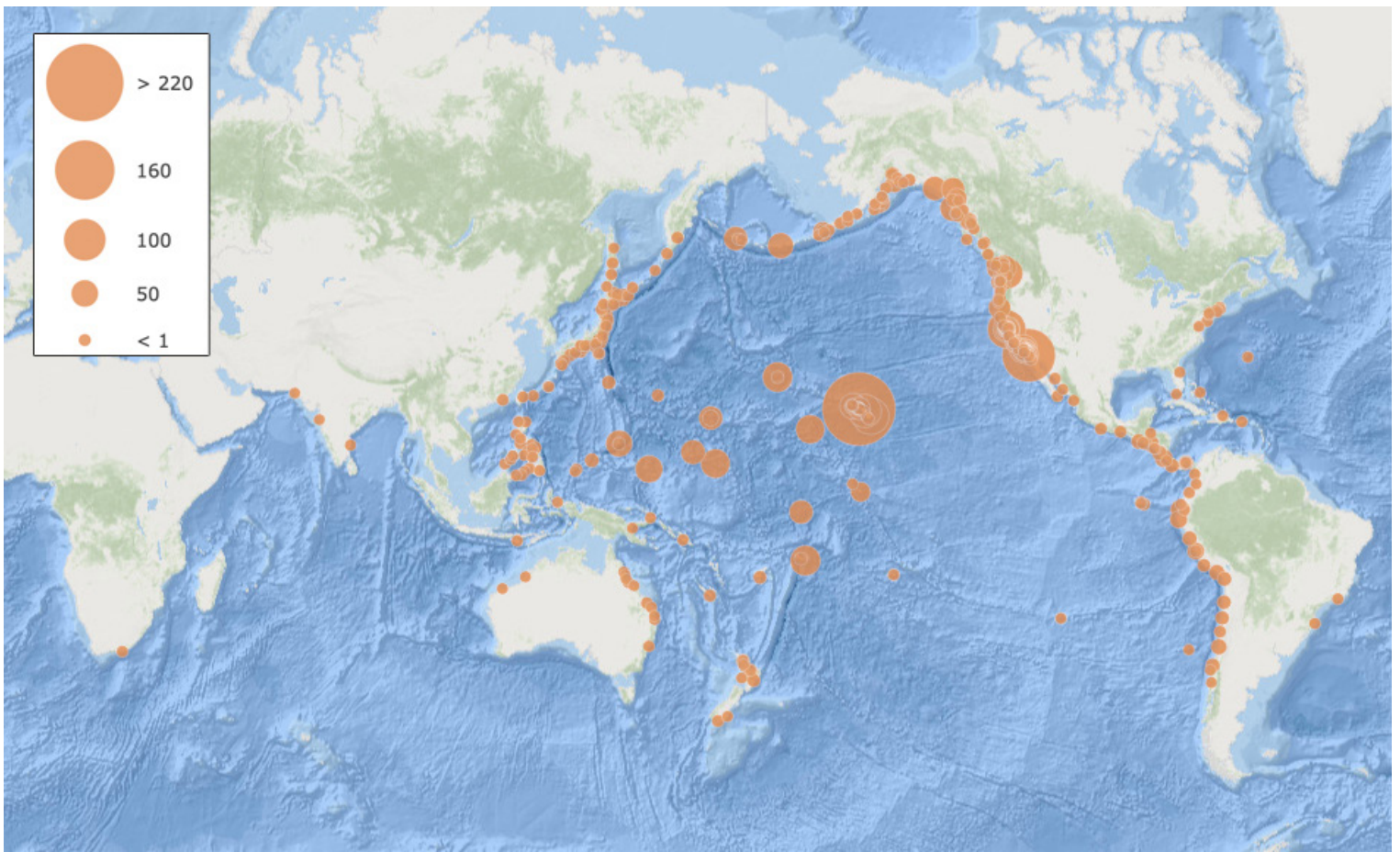


Figure 3: Number of marigrams per location, shown as scaled circles. Honolulu, HI, San Diego, CA, and San Francisco, CA, are the top three within NCEI's collection.

Number of Marigrams	Location
220	HONOLULU, OAHU, HAWAII
149	SAN DIEGO, CALIFORNIA
96	SAN FRANCISCO BAY (PRESIDIO), CALIFORNIA
90	HILO, HAWAII
78	KAHULUI, MAUI, HAWAII
70	SEATTLE, WASHINGTON
67	PAGO PAGO, AMERICAN SAMOA
66	MIDWAY ISLAND, PACIFIC
63	KWAJALEIN ISLAND
62	JOHNSTON ISLAND, PACIFIC OCEAN
2216	OTHER

Table 1: Top ten marigram locations in terms of number of marigrams

The NCEI/WDS Global Historical Tsunami Database currently includes [71 tide gauge runup observations reported between 1854 and 1981 at Honolulu](#). It may be possible to fill in more of the record by careful examination of the marigrams. The maps and table above are a first step in that direction.

2019 PTWC Water Levels Added to Archive and Products

Earlier in the year, we received and archived one year (2019) of 10-second-resolution water level data from nine tide gauge stations in Hawaii operated by the National Weather Service's Pacific Tsunami Warning Center (PTWC). These data have been quality-controlled, and harmonic analysis has been performed by the NCEI/CIRES Water Level Team to remove tidal signals. In contrast with the single-year analysis conducted by the Center for Oceanographic Products and Services, NCEI processes the entire data record (now eight years of data) at once, in order to better remove some of the longer-period tidal components. These products have been converted to netCDF and CSV formats at NCEI and are available for discovery and access via the [tide gauge layer of the Natural Hazards Map Viewer](#) and [via the tide gauge data inventory timeline](#).

Other Activities

NCEI operationalized the ingest and archive of CO-OPS [bridge air gap](#) and [conductivity](#) data, which are used to ensure safety of navigation, improve economic efficiency, and protect coastal resources.